

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: Emballonura semicaudata semicaudata

COMMON NAME: Pacific sheath-tailed bat (American Samoa Distinct Population Segment)

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: 10/11/2005

STATUS/ACTION

☐ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: 03/04/1986 and 05/11/2004

☒ 90-day positive - FR date: 01/21/1987

☒ 12-month warranted but precluded - FR date: 05/11/2005

☐ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? Yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.

We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, most of our national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations, and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (<http://endangered.fws.gov/>).

☐ Listing priority change

Former LP: ____

New LP: ____

Date when the species first became a Candidate (as currently defined): 01/21/1987

____ Candidate removal: Former LPN: ____

____ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

____ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

____ F – Range is no longer a U.S. territory.

____ I – Insufficient information exists on biological vulnerability and threats to support listing.

____ M – Taxon mistakenly included in past notice of review.

____ N – Taxon does not meet the Act's definition of "species."

____ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Mammal: Family Emballonuridae (Sac-winged, Ghost, and Sheath-tailed bats)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Emballonura semicaudata semicaudata occurred historically in American and Independent Samoa, Tonga, Fiji, and Vanuatu.

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:
American and Independent Samoa, Tonga, Fiji, and Vanuatu.

LAND OWNERSHIP: The last known major roosting caves on Tutuila, American Samoa, are part of customary lands belonging to the village of Afono. The land ownership of other islands is unknown.

LEAD REGION CONTACT: Paul Phifer, 503-872-2823, paul_phifer@fws.gov.

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish and Wildlife Office, Marilet A. Zablan, 808-792-9400, marilet_zablan@fws.gov.

BIOLOGICAL INFORMATION

Species Description

This small bat (forearm length c. 45 millimeters, weight 5.5 grams) is a member of the Emballonuridae, an Old World bat family that has an extensive distribution primarily in the tropics (Nowak 1994). The Pacific sheath-tailed bat was once common and widespread in Polynesia and Micronesia and is the only insectivorous bat recorded from a large part of this area (Hutson et al. 2001). Sheath-tailed bats are rich brown to dark brown above and paler below

(Walker and Paradiso 1983). The common name “sheath-tailed bat” refers to the nature of the tail attachment; the tail pierces the tail membrane and its tip appears completely free on the upper surface of the membrane (Walker and Paradiso 1983). The biology of this species, including detailed information on reproduction, habitat use, and diet, is largely unknown (Hutson *et al.* 2001; Wiles and Worthington 2002).

Taxonomy

The classification of this species has received varied treatment, but the most thorough and recent taxonomic evaluation for this species has been conducted by K. Koopman (Koopman 1997; Wiles and Worthington 2002). Koopman (1997) recognizes four subspecies: *E. s. rotensis*, endemic to the Mariana Islands (Guam and the Commonwealth of the Northern Mariana Islands (CNMI)); *E. s. sulcata*, occurring in Chuuk and Pohnpei; *E. s. palauensis*, found in Palau; and *E. s. semicaudata*, occurring in American and Independent Samoa, Tonga, Fiji, and Vanuatu. This assessment addresses the population of *E. s. semicaudata* that occurs in American Samoa. After review of the available taxonomic information, we conclude that *E. s. semicaudata* is a valid subspecies.

Habitat/Life History

The Pacific sheath-tailed bat is a small bat that appears to be cave-dependent, roosting during the day in a wide range of caves, including overhanging cliffs, crevices, and lava tubes (Grant 1993; Grant *et al.* 1994; Hutson *et al.* 2001; Palmeirim 2004). Bats and cave swiftlets (*Aerodramus* spp.) may be found sharing caves (Lemke 1986; Hutson *et al.* 2001; Tarburton 2002; Wiles and Worthington 2002). Large roosting colonies appear common in the Palau subspecies, but smaller aggregations may be more typical of at least the Mariana Island subspecies and perhaps other *Emballonura* (Nowak 1994; Flannery 1995; Wiles *et al.* 1997; Wiles and Worthington 2002). The subspecies that occurs on Aguiguan appears to prefer relatively large caves (G. Wiles, retired Guam DAWR, unpubl. data). The Pacific sheath-tailed bat is nocturnal and typically emerges around dusk to forage on insects (Hutson *et al.* 2001). Survey work on Aguiguan in 2003 revealed that the Mariana Islands subspecies foraged almost entirely in forests (native and non-native) near their roosting caves (Esselstyn *et al.* 2004). Bruner and Pratt (1979) also observed sheath-tailed bats foraging in native forests on Pohnpei.

Historical Range/Distribution

The *E. s. semicaudata* subspecies is historically known from Samoa (Independent and American), Tonga, Fiji, and Vanuatu (Flannery 1995; Koopman 1997). In American Samoa, *E. s. semicaudata* occurred on the Manua (Tau) Islands (Flannery 1995) and on Tutuila (Helgen and Flannery 2002) where it has undergone a precipitous decline probably since around 1990 (Amerson *et al.* 1982; Knowles 1988, Grant *et al.* 1994; Koopman and Steadman 1993; Helgen and Flannery 2002).

Current Range/Distribution

Emballonura s. semicaudata still occurs in part of its historical range, Tonga and Fiji, but has shown drastic declines on the islands where it still occurs and may be extirpated from other islands (Bruner and Pratt 1979; Grant *et al.* 1994; Wiles *et al.* 1997; Tarburton 2002; Wiles and Worthington 2002; Palmeirim 2004). There is some dispute over its historic occurrence on

Vanuatu; regardless, it has not been detected there in recent surveys of the bats of Vanuatu (Flannery 1995; Koopman 1997; Palmeirim 2004). It was still present on some islands of the Kingdom of Tonga in the 1980s (Koopman and Steadman 1995), but its current status and distribution there is unknown (Helgen and Flannery 2002; Palmeirim 2004). The subspecies may be extirpated from Independent Samoa (Grant et al. 1994; Koopman and Steadman 1995; Tarburton 2002), although there were two unconfirmed observations of a few bats there in 1994. Despite the observed serious population decline and contraction of range there, Fiji is believed to harbor most of the extant global population of E. s. semicaudata (Palmeirim 2004). American Samoa DMWR expects to complete an assessment and formal report soon based on their surveys for E. s. semicaudata in American Samoa (R. Utzurrum, in litt. 2005).

Population Estimates/Status

Although previously abundant in Independent Samoa, surveys failed to find bats during surveys there in 1997 and 1992 (Lovegrove et al. 1992; Park et al. 1992). In 2005, bats were not detected during acoustic samples conducted in a few areas of Upolu and Savaii (R. Utzurrum, in litt. 2005). E. s. semicaudata was abundant in Fiji until the 1950s. Recent survey efforts on the main island have been negative though they are still found on many of the offshore islands in the Fiji group (Hutson et al. 2001). In Tonga, the current distribution of E. s. semicaudata is not well known but it appears to be rare (Koopman and Steadman 1995). In fact, within most of the archipelagos, its distribution is poorly documented (Koopman and Steadman 1995).

In American Samoa, Amerson et al. (1982) estimated a total population of approximately 11,000 Pacific sheath-tailed bats in 1975 and 1976, although this number may have been inflated somewhat by confusion of bats with the white-rumped swiftlet (Collocalia spodiopygia) which roosts in the same caves as bats (R. Utzurrum, pers. comm. 1998). Since then, far fewer animals have been observed. Knowles (1988) recorded about 200 in 1988, and in 1993, observers caught one bat and saw only three more (Grant et al. 1994). There is some concern that the subspecies may be extirpated in American Samoa (Grant et al. 1994; R. Utzurrum, American Samoa Department of Marine and Wildlife Resources (DMWR), in litt. 2005).

No bats were detected during surveys conducted in 2004 in 80 percent of the caves on Tutuila, during field sweeps at three widely separated sites on Tutuila, or during two sweeps on two elevations of Mt. Lata, Tau, American Samoa (R. Utzurrum, pers. comm. 2004). Additional acoustic sweeps made in 2005 on Tutuila and the three Manua Islands were negative for bats (R. Utzurrum, in litt. 2005).

DISTINCT POPULATION SEGMENT (DPS)

The definition of “species” in section 3(15) of the Endangered Species Act (Act) includes any distinct population segment(s) of any species of vertebrate fish or wildlife that interbreed when mature. For a population to be listed under the Act as a distinct vertebrate population segment, three elements are considered: 1) the discreteness of the population segment in relation to the remainder of the species to which it belongs, 2) the significance of the population segment to the species to which it belongs, and 3) the populations segment’s conservation status in relation to the Act’s standards for listing (i.e., is the population segment, when treated as if it were a species, endangered or threatened?) (61 FR 4722).

The available information indicates that distinct populations of E. s. semicaudata, a cave-dwelling species whose populations are often highly localized, are definable. The distinct population segment of Pacific sheath-tailed bat in American Samoa is physically discrete in relation to the remainder of the species as a whole. E. s. semicaudata is known from American and Independent Samoa, Tonga, Fiji, and Vanuatu, but has shown drastic declines on the islands where it still occurs, or even to limited areas of single islands. Therefore, severely restricted populations of species such as E. s. semicaudata with its last known major roosting caves in American Samoa on the island of Tutuila, become isolated. The population segment of this species in American Samoa is therefore distinct based on geographic and distributional isolation from remaining Pacific sheath-tailed bats in Independent Samoa, Tonga, Fiji, and Vanuatu.

A population segment is considered “significant” if its loss would constitute a significant gap in the range of the taxon. The American Samoa population of the Pacific sheath-tailed bat represents the easternmost distribution of this species. The loss of this population would truncate the species’ range by approximately 100 miles and perhaps farther if the Samoa population is also extirpated. Such a range reduction constitutes roughly seven percent of the entire known and suspected range, and is significant as this species is believed to be declining range wide. Further, such a range reduction would affect the possibility of dispersal and re-colonization. The population structure of this species may be described as a metapopulation. That is, stochastic events or threats may result in extirpations on some islands, yet these islands may be re-colonized by dispersers coming from other nearby populations (Palmeirim et al. 2005). Having such a structure, the species will only survive in an archipelago if the island colonization rate is sufficiently high to compensate for the rate of extirpation. Colonization rate is clearly proportional to the availability of source populations, so loss of the American Samoa population would reduce the source populations for more than just that 100-mile range (Palmeirim et al. 2005).

Based on the discreteness and significance of the American Samoa population of the Pacific sheath-tailed bat, the U.S. Fish and Wildlife Service (Service) considers this population to be a distinct vertebrate population segment which warrants review for listing under the Act. The American Samoa distinct population segment of the Pacific sheath-tailed bat faces severe and imminent threats. See SUMMARY OF THREATS and Rationale for Listing Priority Number, below.

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range. E. s. semicaudata is undergoing a curtailment of its range; it may be extirpated from Independent and American Samoa and Vanuatu and has been considerably reduced in numbers and distribution on Fiji and Tonga (Lovegrove et al. 1992; Park et al. 1992; Grant et al. 1994; Hutson et al. 2001; Helgen and Flannery 2002; Wiles and Worthington 2002; Palmeirim 2004). No single factor appears to be responsible for the decline of E. s. semicaudata throughout its range (Hutson et al. 2001; Helgen and Flannery 2002) and in fact, several factors acting simultaneously or sequentially are probably involved (Palmeirim 2004). The loss of roosting caves (through various means), the loss of foraging habitat due to deforestation, disturbance by feral ungulates,

and possibly pesticide use are believed to be primary factors (Grant *et al.* 1994; Hutson *et al.* 2001; Wiles and Worthington 2002). Hutson *et al.* (2001) suggest that disturbances to caves and burning of forests have contributed to the decline of bats in Fiji. Pacific sheath-tailed bats are believed to be very sensitive to disturbance in their caves (Grant 1993), but it is difficult to quantify such an impact, and to date, no such efforts have been undertaken. Tarburton (2002) suggests that pesticides may have played an important role in the decline of bats on Independent Samoa since times when insecticides were heavily used were partly coincident with the decline of sheath-tailed bats and swiftlets. Pesticide use may not have been an important factor in bat declines on American Samoa ((R. Utzurrum, *in litt.* 2005).

In American Samoa, the reasons for the decline are unclear, but may have been largely due to the effects of severe storms on roosting caves 13 to 18 years before the present time. Two caves at Anapeapea Cove were reported as roosting sites for most of the bats estimated in 1976-1977. Both caves were severely damaged during several typhoons between 1987 and 1992 and no bats were reported there during 1993 surveys (Grant 1993; Grant *et al.* 1994). Only small numbers of bats have been observed in other caves during those surveys, but there is no information on how many other caves there are, or how many bats they could support (Grant 1993; Grant *et al.* 1994).

Park *et al.* (1992) also suggested that flooding in several caves on Independent Samoa may have been responsible for their disappearance from those caves. The recent flooding doesn't explain the overall population decline there, nor the fact that cave swiftlets are still present in those caves (Hutson *et al.* 2001). In addition to the effects on the roost caves, storms are likely to have a greater negative impact on bats due to the deforestation (Palmeirim 2004) that leads to loss of foraging habitat.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

The Pacific sheath-tailed bat is not known to be hunted or collected, but it may be impacted by human recreational use of caves (Wiles and Worthington 2002). Roost disturbance is a well known problem for many cave dwelling species (Palmeirim 2004). Disturbance at caves may cause bats to leave for alternate roost sites, in turn, increasing their risk of predation and decreasing their roost time, the latter which could increase stress. In addition, because one of the possible reasons for the disappearance of this species is disturbance in roosting caves, conducting surveys for the bats within roosting caves should be discouraged, especially since exit counts (surveys conducted as animals exit caves in the evening to forage) can be conducted instead (Anne Brooke, Service, *in litt.* 2005).

C. Disease or predation.

Introduced species, including rats (*Rattus* spp.) are potential predators of Pacific sheath-tailed bats in American Samoa, but the extent of this possibility is unknown though rats have been postulated as a problem for the Mariana Island subspecies (Wiles and Worthington 2002). It is well known that domestic cats can capture low flying bats and that it has been documented that they wait for bats as they emerge from caves and capture them in flight (Tuttle 1977; Ransome 1990; Woods *et al.* 2003). Consequently, even a few cats can have a major impact on a population of cave-dwelling bats (Palmeirim 2004). Palmeirim (2004) indicates that of the

predators introduced to Fiji, cats are the most likely to prey on bats. Feral cats are present on Tutuila and on Manua Islands in American Samoa (H. Freifeld, USFWS, pers. comm. 2005). The role of these introduced predators in the decline of the Pacific sheath-tailed bat is not proven but it is strongly supported as a factor (Palmeirim 2004).

Likewise, the role of disease in the species' decline is not known as it has not been studied; however, disease could be a factor, especially for a communally roosting species such as the Pacific sheath-tailed bat (Wiles and Worthington 2002). While introduced pathogens are a plausible cause for the decline of this bat, there is currently no evidence for it (Palmeirim 2004).

D. The inadequacy of existing regulatory mechanisms.

Currently, there appears to be minimal protection afforded to the Pacific sheath-tailed bat in American Samoa by Federal or Territorial agencies, or by private individuals or groups. It has been protected in Independent Samoa since 1993 and its protected status elsewhere is uncertain (Hutson et al. 2001).

E. Other natural or manmade factors affecting its continued existence.

The low numbers of individuals and populations of this subspecies place this bat at great risk of extinction from inbreeding and stochastic events such as storms (Wiles and Worthington 2002). The threat is significant in cave-dwelling species whose populations are often highly localized and the few numbers of animals could easily be lost in a severe storm, disease outbreak, or even a disturbance to the roost caves (Wiles and Worthington 2002). A series of severe typhoons has been identified as a possible contributing factor to population declines underway for other, probably anthropogenic reasons, in American Samoa (Grant 1993; Grant et al. 1994; Hutson et al. 2001; Wiles and Worthington 2002). These storms inundated the caves with water, and coral and other types of rubble filled entrances to caves, and it is suspected that the majority of Pacific sheath-tailed bats in those caves were killed (Grant 1993; Grant et al. 1994). In addition, Pacific sheath-tailed bats generally do not fly or feed in severe weather, and because of their high metabolism, bats may easily starve during any typhoons or storms of long duration (Grant 1993; Grant et al. 1994; MacDonald 1993). For example, the 1990 and 1991 typhoons in American Samoa were responsible for significant declines in the bat (Pepper Trail, Senior Forensic Scientist/Bird Unit Coordinator, U.S. Fish and Wildlife Forensics Laboratory, pers. comm. 2002), but unfortunately these declines cannot be quantified due to a lack of baseline survey information.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

The DMWR has recently been working for the past several years to assess the status of the Pacific sheath-tailed bat in American Samoa. There is no management plan or standardized monitoring program or conservation measures currently in effect for E. s. semicaudata.

SUMMARY OF THREATS (including reasons for addition or removal from candidacy, if appropriate):

In summary, current threats to this subspecies are believed to include habitat loss, predation by introduced species, vulnerability due to very small population size, and disturbance to roosting caves (Grant et al. 1994; Hutson et al. 2001; Wiles and Worthington 2002). The greatest threats

at this time are likely habitat loss and degradation, the small numbers of bats detected in the past two decades, and effects of tropical storms.

For species that are being removed from candidate status:

___ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES:

If E. s. semicaudata is extant, conservation measures could include protection of roost caves, forested habitat, and possibly predator control. If E. s. semicaudata is determined by DMWR to be truly extirpated from American Samoa, efforts for the subspecies could be directed towards developing a program for its re-introduction to formerly occupied islands in American Samoa from elsewhere in its range (possibly Fiji). Forests around roosting caves should be preserved, roosting caves should be protected and reforestation and predator control programs would likely need to be established before such re-introductions could occur.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3*
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: The threat of the magnitude is high. The small size and extremely restricted distribution of this subspecies in American Samoa and throughout its range makes it highly susceptible to stochastic natural disturbances, such as typhoons and disease outbreaks, and to human disturbance of their roosting caves, and habitat loss. The American Samoa population may already be extirpated, although the subspecies is still extant in other areas not under U.S. jurisdiction, it is also showing population declines in those areas (Fiji and possibly Tonga).

Imminence: The threat is imminent because the subspecies as a whole has already been extirpated from some islands and is showing drastic declines in other areas (Fiji). E. s. semicaudata may be extirpated from Vanuatu and Independent Samoa as well. The population of this subspecies on American Samoa declined from around 11,000 bats in 1982 to only 200 in 1998. Since that time, few bats have been observed. The current low numbers, believed to be a result of previous habitat disturbance, make the subspecies more immediately vulnerable to any additional threats. In addition, typhoons occur frequently in the area, meaning the threat is ongoing.

Rationale for Change in Listing Priority Number (insert if appropriate)

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted?

No. The subspecies does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the timeframe of the routine listing process. The biggest threat at this time on American Samoa appears to be the vulnerability to stochastic events, such as typhoons, which cannot be addressed through the protections of listing the subspecies. If it becomes apparent that the routine listing process is insufficient to prevent significant losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of the Pacific sheath-tailed bat as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

DESCRIPTION OF MONITORING

The American Samoa DMWR is responsible for monitoring population status of E. s. semicaudata. This agency is funded through the U.S. Fish and Wildlife Service's (Service) Federal Assistance program for wildlife restoration on an annual basis to monitor and manage the fish and wildlife resources of American Samoa, and the Service requests annual updates from DMWR on the status of candidate species. We also review current scientific literature to seek new information about the species. Surveys and monitoring of E. s. semicaudata in other areas throughout their range have been only sporadic and mostly undescribed. However, some more recent assessments of the Pacific sheath-tailed bat indicate a decline in numbers and distribution of Pacific sheath-tailed bats throughout its range in the tropical Pacific (Hutson et al. 2001; Helgen and Flannery 2002; Tarburton 2002; Palmeirim 2004).

Although no regular surveys are conducted for the Pacific sheath-tailed bats in American Samoa, efforts are currently being made to monitor the species. In 2004, researchers conducted searches at 80 percent of the roosting caves on Tutuila and made timed bat detector sweeps at three locations on Tutuila and two on Tau. Field assessments have continued through this fiscal year (2005) and an assessment and write up of the survey efforts should be completed by the end of the year (R. Utzurrum, pers. comm. 2005). Thus far, no bats have been detected during these

recent survey efforts. This assessment thus uses the best available scientific and commercial data, and is therefore adequate to update the status of the species.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Information on the status and monitoring of E. s. semicaudata and review of the 2004 candidate assessment form was solicited from several sources, including the DMWR and several biologists with bat experience. We received comments on the candidate assessment form for this subspecies from DMWR and from a bat biologist with the Guam National Wildlife Refuge (Anne Brooke).

Indicate which State(s) did not provide any information or comments: N/A

LITERATURE CITED

- Amerson, A.B., Jr., W.A. Whistler, and T.D. Schwaner. 1982. Wildlife and wildlife habitat of American Samoa. II. Accounts of flora and fauna. U.S. Fish and Wildlife Service, Washington, D.C.
- Bruner, P.L. and H.D. Pratt. 1979. Notes on the status and natural history of Micronesian bats. *Elepaio* 40:1-4.
- Erwin, T. L. 1991. An evolutionary basis for conservation strategies. *Science* 253:75-82.
- Esselstyn, J.A., G.J. Wiles, and A. Amar. 2004. Habitat use of the Pacific sheath-tailed bat (Emballonura semicaudata) on Aguiñan, Mariana Islands. *Acta Chiropterologica* 6: 303-308.
- Flannery, T. 1995. Mammals of the south-west Pacific and Moluccan Islands. Cornell University Press, Ithaca, New York.
- Grant, G.S. 1993. Sheath-tailed bats—Tutuila's rarest mammal. Pp. 51-52 in American Samoa: Natural History and Conservation Topics, Vol. 1. Biological Report Series, Report No. 42, Department of Marine and Wildlife Resources, American Samoa.
- Grant, G.S., S.A. Banack, and P. Trail. 1994. Decline of the sheath-tailed bat Emballonura semicaudata (Chiroptera: Emballonuridae) on American Samoa. *Micronesica* 27:133-137.
- Helgen, K.M. and T.F. Flannery 2002. Distribution of the endangered Pacific sheath-tail bat (Emballonura semicaudata). *Australian Mammalogy* 24: 209-212.
- Hutson, A.M., S.P. Mickleburgh, and P.A. Racey (compilers). 2001. Microchiropteran bats:

- global status survey and conservation action plan. IUCN/SSC Chiroptera Specialist Group, International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland and Cambridge, United Kingdom.
- Knowles, W.C. 1988. The status of the wildlife and wildlife habitats in American Samoa. Annual report, Department of Marine and Wildlife Resources, American Samoa.
- Koopman, K.F. 1997. The subspecies of Emballonura semicaudata (Chiroptera: Emballonuridae). J. Mamm. 78(2):358-360.
- Koopman, K.F. and D.W. Steadman. 1995. Extinction and biogeography of bats on Eua, Kingdom of Tonga. American Museum Novitates 3125:1-13.
- Lovegrove, T., B. Bell, and R. Hay. 1992. The indigenous wildlife of Western Samoa: impacts of cyclone Val and a recovery and management strategy. New Zealand Dept. of Conservation. 61 pp.
- MacDonald, D. (ed). 1993. The encyclopedia of mammals. Facts on File, New York. 895 pp.
- Nowak, R.M. 1994. Walker's bats of the world. The Johns Hopkins University Press, Baltimore, Maryland.
- Palmeirim, J.M. 2004. Distribution, status, and conservation of bats in the Fiji islands. Draft (unpublished) report to Flora and Fauna International. 52pp.
- Park, G., R. Hay, A. Whistler, and T. Lovegrove. 1992. The national ecological survey of Western Samoa: The conservation of biological diversity in the coastal lowlands of Western Samoa. New Zealand Dept. of Conservation. 205 pp.
- Tarburton, M.K. 2002. Demise of the Polynesian sheath-tailed bat Emballonura semicaudata in Samoa. Micronesica 34: 105-108.
- Walker, R.M. and J.L. Paradiso. 1983. Walker's mammals of the world, 4th edition. The Johns Hopkins University Press, Baltimore, Maryland.
- Wiles, Gary J. and David J. Worthington. 2002. A population assessment of Pacific sheath-tailed bats (Emballonura semicaudata) on Aguiguan, Mariana Islands. Unpublished report to the U.S. Fish and Wildlife Service, Honolulu, HI. 31 pp.
- Wiles, G. J., J. Engbring, and D. Otobed. 1997. Abundance, biology, and human exploitation of bats in the Palau Islands. J. Zool. (London) 241: 203-227.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: **Acting** David Wesley 11/10/05
Regional Director, Fish and Wildlife Service Date

Marilet A. Zablan

Concur: _____ August 23, 2006
Director, Fish and Wildlife Service Date

Do not concur: _____
Director, Fish and Wildlife Service Date

Date of annual review: 10/07/2005

Conducted by: Dr. Ann P. Marshall (Pacific Islands Fish and Wildlife Office review by: Marilet A. Zablan, Vertebrate Conservation Program Leader; Gina M. Shultz, Assistant Field Supervisor for Endangered Species; and Patrick Leonard, Field Supervisor)